Description of InputSetup

Function

INPUTSETUP is used to set up input folders and files for HIPIMS

Calling format

InputSetUp(caseFolder,Z,R) set up input files of a case. *caseFolder* is the location of the folder storing input and output files. *Z* is a matrix storing elevation value of DEM file. *R* is a 3*2 matrix of DEM spatial-reference information, including the coordinate of the original points of the raster and the size of the grid. *Z* and *R* could be created separately (*makerefmat*) or read from existing Arc ascii files via *arcgridread*. All other parameters of HiPIMS are default values if the input parameters are as listed above.

InputSetUp (caseFolder, Z, R, Name, Value) *caseFolder* is the location of the folder storing input and output files. Z is a matrix of elevation value. R is a spatial-reference matrix of DEM. Name-Value Pair Arguments are listed as Table 1.

Table 1 Name-Value pair arguments

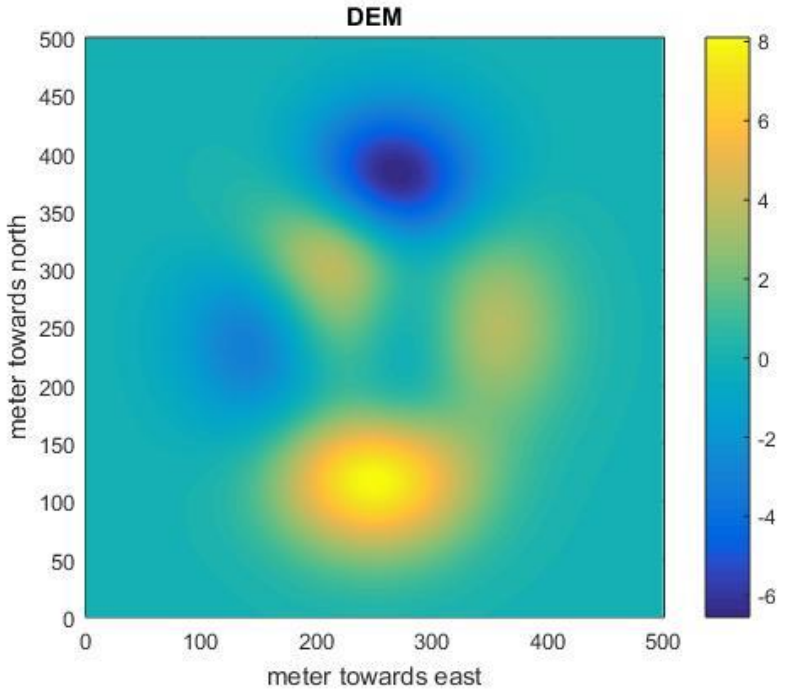
Parameter Type	**Name** (Case sensitive)	**Default | Alternative Values**	**Value Format**	**Note**
Decision Flags	h_Eta	'h'| 'eta'	string	simulation with water depth (h) or water elevation (eta)
	WriteAllFiles	false| true	logical	Whether to generate all the input files
Gauge coordinates	GaugeCoor	[ ]	2-column numeric array	Coordinates of the gauge points inside domain
Boundary conditions	IO_BoundFrame	[ ]	4*n numeric array	Extent of the input-output boundaries. *n* is the number of IO boundaries
	BoundType	'open'| 'rigid', 'hgiven', 'Qgiven', 'hQgiven'	string or Cell of multiple strings	Type of boundaries. '*hgiven*' means water depth /elevation in the bound is pre-defined; '*Qgiven*' means the discharge/water velocity in the bound is pre-defined; *'hQgiven'* means both depth and discharge in the bound is predefined.
	h_BC_Source	{[0 0]}	Cell of numeric 2-column arrays	Data of pre-defined water depth/elevation. The number of 2-column arrays should be the same with the number of boundaries that h/eta has been given. The first column of the array is time(s) and the second column is the water depth/elevation (m).

	hU_BC_Source	{[0 0 0]}	Cell of 2-column /3-column numeric arrays	Data of pre-defined water discharge/ water velocity. The number of numeric arrays should be the same with the number of boundaries that discharge/velocity has been given. The first column of the array is time(s) and if the array is 2-col, the second column is the discharge (m^3/s) or if the array is 3-col, then the second and third column are water velocity (m/s) in x and y direction respectively.
	BoundCode (not recommended)	[2 0 0; 2 1 0]	2*3n numeric array	Not recommended unless the alternative bound types cannot fulfil your requirements. It conveys more specific information of BoundType with numeric arrays.
Initial conditions	initial_hE	0	scalar or numeric array with the same size of Z	Initial water depth/elevation. If it is a scalar, then all the grids in the domain have the same initial h/eta value.
	initial_hU	{0 0}	scalar (0) or cell of two numeric arrays with the same size of Z	Initial water velocity. Two components of the cell represent initial velocity in x and y direction respectively. If it is a scalar, then all the grids in the domain have the same initial water velocity value in both x and y direction.
	initial_hE_hU_pre (not recommended)	{0, {0 0}, 0}	cell of three numeric arrays	It is a combination of all initial conditions, including initial h, hU and precipitation. The last one (precipitation) is always 0 at current version.
Rainfall	RainMask	0	scalar or numeric array with the same size of Z	It is the serial number of rainfall source starting from 0. Grids with the same serial number will have the same rainfall from the same source.
	RainSource	[0 0; 3600 0]	numeric array or cell of 2-column numeric arrays	To give rainfall value for different region of the domain. If it is a numeric array, the first column is time(s) and the second and right forward columns are the rainfall rate(m/s), and the output rainfall source file will be a single file named 'precipitation_source_all.dat'. The

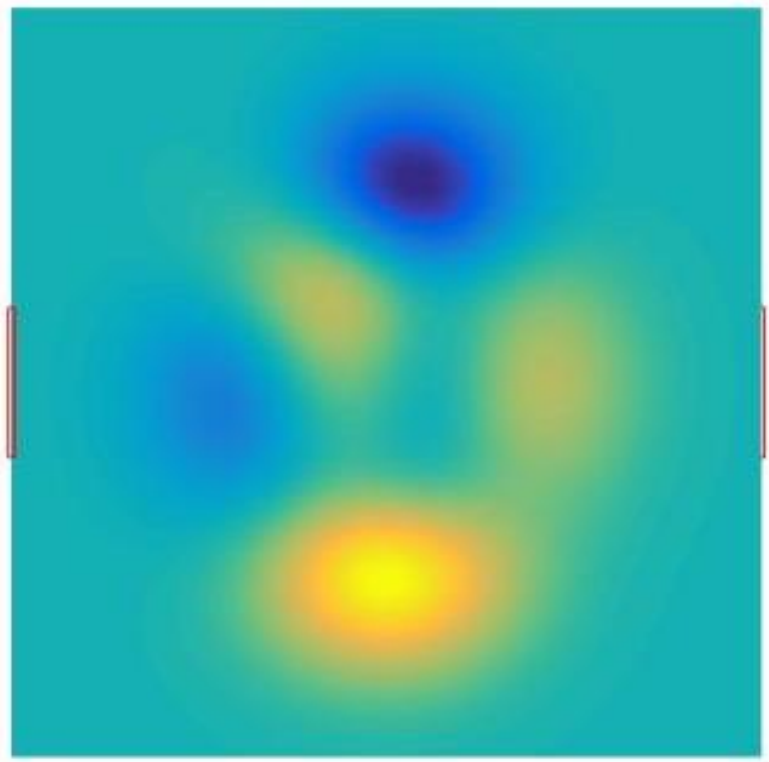
				number of the single array column should be in accordance with the number of rainfall source in RainMask. If it is a cell of 2-column numeric arrays, each array conveys the time (s, 1st column) and rainfall rate (m/s, 2nd column) of one single rainfall source. Multiple files of rainfall source will be generated and named as 'precipitation_source_n.dat'. The number of 2-column numeric arrays should be in accordance with the number of rainfall source.
Hydro Parameter Values	manning	0.035	scalar or numeric array with the same size of Z	It is manning coefficient. If it is a scalar, then all the grids in the domain have the same manning value.
	sewer_sink	0	scalar or numeric array with the same size of Z	It is sewer sink rate (m/s). If it is a scalar, then all the grids in the domain have the same sewer sink value.
	cumul_depth	0	scalar or numeric array with the same size of Z	It is one of the infiltration parameters. If it is a scalar, then all the grids in the domain have the same cumulative depth value.
	hydraulic_conductivity	0	scalar or numeric array with the same size of Z	It is one of the infiltration parameters. If it is a scalar, then all the grids in the domain have the same hydraulic conductivity value.
	capillary_head	0	scalar or numeric array with the same size of Z	It is one of the infiltration parameters. If it is a scalar, then all the grids in the domain have the same capillary head value.
	water_content_diff	0	scalar or numeric array with the same size of Z	It is one of the infiltration parameters. If it is a scalar, then all the grids in the domain have the same water content diff value.
	hydro_params_Value (not recommended)	{0.035, 0, 0, 0, 0, 0}	scalar or numeric array with the same size of Z	It is a combination of all the six hydro parameter parameters.

Example

```
%% Example to create input files based on a peaks DEM
%% creat a DEM with Z and R
Z = peaks(500); % elevation values of DEM
gridL = 1; % length of each square grid
x11 = 0; % coordinates of the center of the upper left point
y11 = (size(Z,1)-1)*gridL;
R = makerefmat(x11,y11,gridL,-gridL); %spatial reference of DEM
mapshow(Z,R,'DisplayType','surface'); colorbar; box on;
title('DEM'); xlabel('meter towards east'); ylabel('meter towards north');
```




```
%% define boundary condition
% outline boundary
outlineBoundType = 'open';
% coordinates of the end row/col of Z
x_end = x11+(size(Z,2)-1)*gridL;
y_end = y11+(size(Z,1)-1)*(-gridL);
% input-output boundary 1
IO_Bound1_Frame = [x11-2*gridL 2*y11/5, x11+2*gridL 3*y11/5];
IO_Bound1_Type = 'Qgiven';
dischage = [0 30; 3600 300; 7200 30; 10800 30];
% input-output boundary 2
IO_Bound2_Frame = [x_end-2*gridL 2*y11/5, x_end+2*gridL 3*y11/5];
IO_Bound2_Type = 'hgiven';
depth = [0 1; 3600 3; 7200 1; 10800 1];
IO_BoundFrame = [IO_Bound1_Frame; IO_Bound2_Frame];
boundType = {outlineBoundType,IO_Bound1_Type,IO_Bound2_Type};
h_source = depth;
Q_source = dischage;
% show the IO bound frames
mapshow(Z,R,'DisplayType','surface');box on; axis off
rectangle('Position',[x11-2*gridL 2*y11/5 gridL*4 y11/5],'EdgeColor','r')
rectangle('Position',[x_end-2*gridL 2*y11/5 gridL*4 y11/5],'EdgeColor','r')
```



```
%% define rainfall condition
% rainfall mask: two rainfall source, north(0) and south(1)
rainMask = zeros(size(Z)); rainMask(round(size(Z,1)/2):end,:) = 1;
rainSource = [0    ,  0, 100/3600/4;...
              3600,  0, 200/3600/4;...
              7200,  0, 100/3600/4;...
              7201,  0, 100/3600/4];
%% generate input files
caseFolder = cd;
InputSetup(caseFolder, Z, R,...
        'IO_BoundFrame',IO_BoundFrame,'BoundType',boundType,...
        'h_BC_Source',h_source,...
        'hU_BC_Source',Q_source,...
        'RainMask',rainMask,'RainSource',rainSource,...
        'WriteAllFiles','true');
```